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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/080,488	02/22/2002	Henry Esmond Butterworth	GB919990129US1	8490

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EXAMINER

BRAGDON, REGINALD GLENWOOD

ART UNIT	PAPER NUMBER
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2188

DATE MAILED: 12/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/080,488

Applicant(s)

BUTTERWORTH ET AL.

Examiner

Reginald G. Bragdon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 February 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

2. The Information Disclosure Statement(s) received 03 October 2003 has been considered. Please see the attached PTO-1449(s).

Oath/Declaration

3. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:

Non-initialed and/or non-dated alterations have been made to the oath or declaration. See 37 CFR 1.52(c).

There are non-initialed alterations for the signature for William James Scales.

Drawings

4. The drawings filed on 22 February 2002 have been approved by the Examiner.

Specification

5. The disclosure is objected to because of the following informalities: there is no discussion in the specification for figure 4.

Appropriate correction is required.

Claim Objections

6. Claims 4-8, 11, and 15-22 are objected to because of the following informalities:

As per claim 4, line 3, "each logical track" implies that a plurality of logical tracks has been set forth previously, however there is no mention of "logical tracks" in claim 1. The Examiner suggests changing "each logical track" to --a logical track--.

As per claim 5, line 4, "the RAID-5" should be --a RAID-5--.

As per claim 8, lines 5-6, "the expanded array" lacks antecedent basis and should be --the plurality of information storage devices including the additional information storage device--.

As per claim 11, line 4, "is" should be deleted.

As per claim 11, line 4, "00s" should be --zeroes--.

As per claim 11, line 9, "(" should be deleted.

As per claim 11, line 11, "an" should be deleted.

As per claim 15, line 3, "each logical track" implies that a plurality of logical tracks has been set forth previously, however there is no mention of "logical tracks" in claim 12. The Examiner suggests changing "each logical track" to --a logical track--.

As per claim 16, line 11, "andmeans" should be --and means--.

As per claim 17, line 1, "A" should be deleted.

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As per claim 18, line 1, "A" should be deleted.

As per claim 19, line 1, "A" should be deleted.

As per claim 19, line 3, "each logical track" implies that a plurality of logical tracks has been set forth previously, however there is no mention of "logical tracks" in claim 16. The Examiner suggests changing "each logical track" to --a logical track--.

As per claim 20, line 8, "An" should be --an--.

All dependent claims are objected to as having the same deficiencies as the claims they depend from.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claim 11 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

On page 17, line 27, it is not clear what is meant by the phrase "cached by RAID 5 array location".

9. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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10. Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As per claim 11, lines 7 and 9, "the RAID array" lacks antecedent basis.

As per claim 11, line 8, it is not clear what is meant by the phrase "by RAID 5 array location".

As per claim 11, line 8, "the cache" lacks antecedent basis.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1-8 and 12-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schultz et al. (6,058,489) in view of Brady et al. (5,671,390).

As per claims 1, 12, 16, and 20, Schultz et al. teaches an information processing system including a host computer attached to a RAID-5 array of disk devices via a disk controller. See figures 1 and 2A and column 2, lines 41-43. An additional disk drive can be attached to an existing array of disk drives. See figure 2B and column 8, lines 37-38. As can be seen from figures 2B and 2C, an additional striping unit ("strip") is added to each row ("stripe") of the array of disks ("logically appending an additional strip...to the end of each stripe...").

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Schultz et al. does not teach that the controller is a log structured array (LSA) controller which defines a directory of stripes. Brady et al. teaches the use of a log structured array storage subsystem comprised of a storage array and an array controller. See column 1, lines 46-49. The LSA controller includes a directory which indicates the current physical location of data associated with each logical track on the disks of the array. See column 1, lines 26-30. It would have been obvious to one of ordinary skill in the art to have modified the controller of Schultz et al. to implement an LSA controller with a directory, as suggested by Brady et al., because Brady et al. teaches that an LSA storage subsystem provides an inexpensive, high performance, lower cost, and higher reliability system at column 1, lines 43-46.

As per claims 2, 13, 15, and 21, Schultz et al. teaches that the array is a RAID-5 array as noted above, wherein a RAID-5 array is an $N+1$ array of N data locations and 1 parity location per stripe.

As per claims 3, 14, 18, and 22, the RAID-5 array of Schultz et al. includes stripes of N data striping units and 1 parity striping unit. As taught by Brady et al, each striping unit or segment of the array includes a plurality of logical tracks. See column 2, lines 43-45.

As per claim 4, 15, and 19, Brady et al. teaches that the directory indicates the current physical location of data associated with a logical track (see column 2, lines 30-31). The current location of data is based on the segment ("stripe") and column ("offset...within the stripe") of the logical track. See column 2, lines 1-7.

As per claim 5, Schultz et al. and Brady et al. (see column 2, lines 8-15) teach a RAID-5 architecture, where the parity striping unit (segment-columns of Brady et al.) are rotated amongst

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the disk of the array. As shown by Shultz et al. in figure 2C, selected data (which can include parity strips) are moved to the newly added disk.

As per claim 6, Schultz et al. teaches that the disk array configuration is performed as a background task, i.e. during normal I/O operations to the storage devices. See the abstract.

As per claim 7, Schultz et al. teaches that the disk array configuration is performed as a background task by firmware on a disk controller board. See the abstract.

As per claim 8, Brady et al. teaches a bitmap at figures 5a-c, where the bitmap indicates which tracks are valid within a segment. See column 8, lines 47-67.

13. Claims 1-10, and 12-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Choy et al. (5,758,118) in view of Brady et al. (5,671,390).

As per claims 1, 12, 16, and 20, Choy et al. teaches an information processing system including a host 202 attached to a RAID-5 array of disk devices via a RAID master controller 204. See figure 2 and column 5, lines 14-15. An additional disk drive 222 can be attached to an existing array of disk drives. See column 5, lines 30-31. As can be seen from figure 4, an additional "strip" (column 406 of table 400) is added to each row ("stripe") of the array of disks ("logically appending an additional strip...to the end of each stripe...").

Choy et al. does not teach that the controller is a log structured array (LSA) controller which defines a directory of stripes. Brady et al. teaches the use of a log structured array storage subsystem comprised of a storage array and an array controller. See column 1, lines 46-49. The LSA controller includes a directory which indicates the current physical location of data associated with each logical track on the disks of the array. See column 1, lines 26-30. It would have been obvious to one of ordinary skill in the art to have modified the controller of Choy et al.

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to implement an LSA controller with a directory, as suggested by Brady et al., because Brady et al. teaches that an LSA storage subsystem provides an inexpensive, high performance, lower cost, and higher reliability system at column 1, lines 43-46.

As per claims 2, 13, 15, and 21, Choy et al. teaches that the array is a RAID-5 array as noted above, wherein a RAID-5 array is an $N+1$ array of N data locations and 1 parity location per stripe.

As per claims 3, 14, 18, and 22, the RAID-5 array of Choy et al. includes stripes of N data striping units and 1 parity striping unit. As taught by Brady et al, each striping unit or segment of the array includes a plurality of logical tracks. See column 2, lines 43-45.

As per claim 4, 15, and 19, Brady et al. teaches that the directory indicates the current physical location of data associated with a logical track (see column 2, lines 30-31). The current location of data is based on the segment ("stripe") and column ("offset...within the stripe") of the logical track. See column 2, lines 1-7.

As per claim 5, Choy et al. and Brady et al. (see column 2, lines 8-15) teach a RAID-5 architecture, where the parity striping unit (segment-columns of Brady et al.) are rotated amongst the disk of the array. As shown by Choy et al. in figure 4, selected data (which can include parity strips) are moved to the newly added disk.

As per claims 6 and 7, Choy et al. teaches that the disk array configuration is performed by the controller, i.e. during normal I/O operations to the storage devices, and is therefore a background task to the host device. See column 5, lines 3-5.

As per claim 8, Brady et al. teaches a bitmap at figures 5a-c, where the bitmap indicates which tracks are valid within a segment. See column 8, lines 47-67.

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As per claim 9, Choy et al. teaches initializing the newly added disk to all binary zeros at column 5, lines 27-30.

As per claim 10, Choy et al. teaches adding one or more ("plurality of...") DASDs to the RAID array at column 3, lines 5-7.

Remarks

14. No prior art has been applied to claim 11 given the ambiguities detailed above under 35 U.S.C. 112, first and second paragraph.

Conclusion

15. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Hale et al. (5,502,836) teaches expanding a RAID-5 array.

16. Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

All "OFFICIAL" patent application related correspondence transmitted by FAX must be directed to the central FAX number at **(703) 872-9306**:

"INFORMAL" or "DRAFT" FAX communications may be sent to the Examiner at **(703) 746-5693**, only after approval by the Examiner.

Hand-delivered responses should be brought to Crystal Park II, 2121
Crystal Drive, Arlington, VA., Fourth Floor (receptionist).

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17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Reginald G. Bragdon whose telephone number is (703) 305-3823. The examiner can normally be reached on Monday-Thursday from 7:00 AM to 4:30 PM and every other Friday from 7:00 AM to 3:30 PM.

The examiner's supervisor, Mano Padmanabhan, can be reached at (703) 306-2903.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 305-3900.

RGB
November 25, 2003

Reginald G. Bragdon
Reginald G. Bragdon
Primary Patent Examiner
Art Unit 2188